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Original Article

Effects of Rhythmic Stabilization and Mckenzie Techniques on Pain and Function in Patients with Non-Specific Chronic Low Back Pain

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ABSTRACT

Non-specific chronic low back pain affects 90% of people around the world, resulting in impairment. Their quality of life can be enhanced by exercising. However, due to the complexity of non-specific chronic low back pain (NSCLBP) the most effective type of exercise as a rehabilitation technique is unknown, and more research is required. **Objective:** To assess the effects of rhythmic stabilization and McKenzie techniques on pain and function in patients with NSCLBP. **Methods:** A total of 36 NSCLBP patients were randomly assigned to the McKenzie group and the rhythmic stabilization group. Over a four weeks' period, both groups received 12 sessions. Numeric pain rating scale (NPRS), modified oswestry low back pain (MODI), and bubble inclinometer were used to measure outcomes at baseline of 2nd, and 4th week. **Results:** Across the group, both rhythmic stabilization and McKenzie's results were significant. McKenzie had more significant results within the group than rhythmic stabilization ($p<0.05$). **Conclusion:** It was concluded that both rhythmic stabilization and McKenzie were helpful in improving pain, functional status, and mobility, with significant changes in NPRS, MODI score, and ranges. In CNSLBP patients, however, McKenzie's technique was demonstrated to be more effective in alleviating pain and impairment, as well as improving mobility, when compared to the technique of rhythmic stabilization.

INTRODUCTION

Low back pain that is not caused by a specific pathology like osteoporosis, fractures, infections, tumors, structural deformities, and inflammatory diseases such as ankylosing spondylitis, cauda equina syndrome, and radicular syndrome is defined as non-specific chronic low back pain (NSCLBP) by the European recommendations for the treatment of chronic nonspecific low back pain [1]. Around 18 % of the population suffers from low back pain on a global scale and approximately 39 % will be suffering not less than an episode of back pain at least once in their life [2]. The approximation is that between 5.0% and 10.0% of the population result in the onset of chronic low back pain, which is responsible for costly treatments, patient suffering, and sick leave additionally being one of the key reasons for people to pursue health care services [3]. In adults, the annual worldwide incidence of low back pain LBP is 15% and the point prevalence is 30% [4]. Lack of physical activities and a sedentary lifestyle, which can result in muscular weakness and power loss, is a predictor of low back pain that leads to recurrent LBP [5]. The cause of non-specific LBP is multifactorial [6]. Patients have become increasingly uncertain of the growing variety of therapy techniques usually given as a method for coping with their problems due to the self-limiting nature of CLBP [7]. In these circumstances, conservative treatment focused on physiotherapy is the safest treatment option for

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patients [8]. There is also plenty of evidence that therapeutic exercise can assist individuals with chronic non-specific LBP with pain and disability [9]. Proprioceptive neuromuscular facilitation (PNF) exercises use proprioceptors to improve neuromuscular pathway responsiveness. PNF training may even excite the proprioceptors in the lower back muscles and joints, which may be beneficial in improving balance and sensorimotor modulation [10]. PNF exercises improve flexibility and break the pain-spasm cycle which results in improvement of lumbar range of motion. The topographic organisation of the muscles being treated is taken into account when performing PNF workout programmes [11]. Proprioceptive neuromuscular facilitation (PNF) exercises maximize improvements in flexibility. Prior research advocated the three most common PNF approaches for CLBP, rhythmic stabilization (RS), chop and lift (CL) [12]. The approach involves isometric muscular contractions of antagonistic patterns, which outcomes in antagonist co-contraction if the physiotherapist does not interfere with the isometric contraction. Mechanical Diagnosis and Therapy (MDT), also termed as McKenzie method, is a well-known classification system [13]. McKenzie's extension exercise program aiming at sustained posture or repeated movement in a precise direction, along with an educational approach and following instructions, could reduce the severity of pain in low back discomfort, both acute and sub-acute [14, 15]. Various studies have previously been carried out on the non-specific CLBP using PNF techniques, McKenzie, and core stability exercises, but there is a study gap regarding comparing rhythmic stabilization and McKenzie techniques in pain reduction, and functional status improvement, and lumbar ROM.

This study was conducted to provide an evidence-based approach to the impact of rhythmic stabilization and McKenzie approach on pain and function in individuals with chronic non-specific low back pain.

METHODS

This single-blinded, randomized clinical trial was initiated in October 2021 and ended in February 2022 at Department of Physiotherapy, Rasheed Hospital Lahore, Pakistan after receiving approval from the ethics committee of Riphah International University Lahore, Pakistan (Ref.No.REC/RCR and AHS/21/0121). This trial was registered with ClinicalTrials.gov NCT05207605. A sample size of 40 people was calculated, with a 10% attrition rate calculated by epitool. Sample size was used to detect a significant difference between two means. The mean of both groups were 24 and 22.67, with a variance of 2, confidence level of 0.95 and a power of 0.8. It was a 2 tailed analysis and sample size per group was 18 and for both groups was 36. Due to transportation issues, one participant in the rhythmic stabilization group did not receive the intervention, and another dropped out of the study due to financial concerns. Two McKenzie group members dropped out due to personal reasons. The study had 36 participants who completed it and the results were analyzed. The consort flow diagram for the study is shown in figure 1.

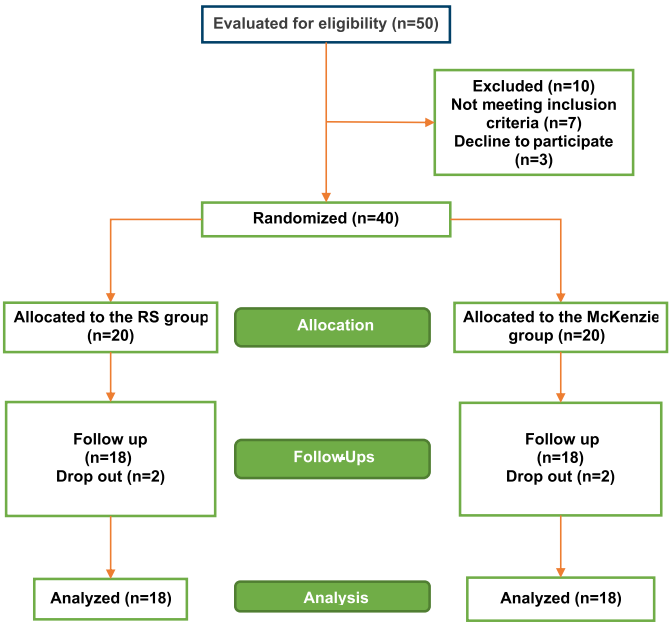

Figure 1: Consort Flow Diagram for Study Design

Subjects with NSCLBP suffering discomfort for at least three months were enrolled, with an age range of 18 to 45 years, at least with mild to moderate pain scoring 2-6 out of 10 on the pain scale. Patients agreement was obtained before therapy, and the treatment method was explained. Members were rejected if there is any set of experiences any feeling of pain below gluteal fold or pain radiating in legs, metabolic and neurologic condition, pathological conditions, past experience of any back or lower limb surgical procedure, pregnancy or any experience of other physiotherapy treatment in past few weeks. Participants were allocated into 2 groups (A and B) by non-probability consecutive random sampling. The outcome assessor diagnosed the patient's disorder before any intervention, observe and examined baseline values before treatment technique, post-treatment values after two weeks, and post-treatment values after 4 weeks of intervention. Initially, fifty people were considered for inclusion. Seven individuals were dropped from the study because they didn't match the eligibility requirements, and three others declined to take part. Participants who meet the inclusion criteria were registered. A complete physical history and assessment of demographic characteristics (age, height, weight, BMI, etc.) were collected. Three sessions of treatment per week with a total of twelve sessions were

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given in four weeks. Patients were requested to maintain other normal activities and avoid performing any other treatment protocol during the study duration. Other than the selected treatment protocol, patients were not allowed to administer other techniques like steroids, tapings, other electrotherapy modalities, and other manual therapy techniques during the interventional trial. When the patient walked in for the initial visit, he or she was asked to fill out the NPRS and MODI questionnaire. As a standard course of treatment for non-specific chronic low back pain in both groups, a heat pack was applied for 15 minutes before the technique was given. Participants in Group A received rhythmic stabilization techniques. The patient was requested to maintain a sitting position and the physical therapist stands in front of the patient. The rhythmic stabilization techniques (RST) programme involved doing 10 seconds of alternating isometric trunk flexion-extension contractions against a resistance with no anticipated movement. In the presence of a similar physiotherapist, the patient completes three sets of fifteen repetitions at maximum resistance. Rest periods of 30 and 60 seconds were permitted after completing 15 repetitions of each pattern and in between sets. Each patient received the RS technique programme for a total of about 33 minutes. The McKenzie approach was taught to Group B participants. Group B patients were instructed to perform four extension and three flexion exercises. Group B four extension exercises were: First exercise include the patient lying in a face-down position for one to two minutes. Second, involves having the patient lie in an extension position with their face down. The patient was first encouraged to lie face down, then be asked to extend their trunk on their elbows and hold for five seconds before returning to the beginning position as a relaxation. Third, with an extension exercise in lying posture, the patient was asked to lie face-down for ten seconds, then conduct a trunk extension followed by elbow extension (push-up position), and then return to the original position for rest. Forth, include trunk extension in standing posture, in which the patient is asked to stand and then directed to conduct trunk extension for five seconds with hands on back and fingers pointing backward, followed by relaxation and return to standing position. Each extension exercise was performed twice for a total of ten repetitions. The flexion exercises in Group B were; First, in order to incorporate flexion in the lying position, the patient was directed to lie supine and do trunk flexion with both knees holding the chest, which she was to hold with both hands. Patients were taught to hold that position for a few seconds before returning to the starting position to relax. Second, the patient was instructed to perform the exercise by sitting on the edge of a chair and bending forward while gripping either an ankle or the floor with both hands. After holding this position for five seconds, the start position was relaxed once more. Third, the patient was requested to stand and then advised to bend forward or perform trunk flexion as far as they could with their fingers down to their knees with flexion on standing. The patient was requested to hold the prior position for five seconds before returning to standing position as a relaxation exercise. All of the exercises in the flexion group were also repeated twice for a total of ten repetitions. After a three-minute rest period, each set is completed. The McKenzie therapy lasted between 20 and 40 minutes [16]. The primary outcome measures were NPRS and MODI scales, and lumbar range of motion was recorded using a bubble inclinometer at baseline, two weeks after treatment, and four weeks after treatment. SPSS for Windows Software, version 25.0 was used to analyze the data. $p<0.05$ was used to calculate statistical significance. The Shapiro-Wilk test resulted in a value larger than 0.05, the data had been found to be distributed equally, and parametric tests were used to analyze it.

RESULTS

This study was completed with 36 NSCLBP patients, eighteen in each group. Table 1 shows demographic data of the patients, male: female ratio was 12:24. The mean age of Group A was 36.61 + 7.19 years while in Group B was 31.89 ± 6.81 years. While the patients had a minimum BMI of 17 and a maximum BMI of 26, their total mean was 21.30 ± 2.21 (table 1).

Table 1: Participant Demographic Data

Variables	Frequency (%)
Gender	
Male	12 (33)
Female	24 (66.7)
Age (Mean ± SD)	
Group A	36.61 ± 7.19
Group B	31.89 ± 6.81
BMI	
Mean ± SD	21.30 ± 2.21

Comparison of clinical variables within the groups using a level of significance less than 0.05 is shown in table 2. Both Groups had Significant Findings, However Group B Findings are more Significant than Group A (table 2).

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Table 2: Comparison of Clinical Variables within the Groups

Variables		Group A Mean ± SD	Group B Mean ± SD	Rhythmic Stabilization	McKenzie	p-Value
NPRS	Baseline - Week 2	5.89 ± 0.47	5.72 ± 0.67	1.33	1.88	0.03
	Week 2 - Week 4	4.56 ± 0.78	3.83 ± 0.92	1.94	1.83	0.002
	Week 4 - Baseline	2.61± 0.78	2.00 ± 0.59	3.2	3.72	0,.001
NPRS	Baseline - Week 2	36.12 ± 5.28	34.33 ±5.89	7.56	6.05	0.04
	Week 2 - Week 4	28.61 ± 6.29	28.27 ±5.49	4.61	5.61	0.02
	Week 4 - Baseline	24.00 ± 8.25	22.67 ±5.37	11.67	12.68	0.01
NPRS	Baseline - Week 2	39.89 ± 3.63	39.94 ± 1.59	3.78	6.39	0.005
	Week 2 - Week 4	43.67 ± 3.53	46.33 ± 2.14	5.89	7.33	0.002
	Week 4 - Baseline	49.56 ± 2.75	53.67 ± 1.78	9.67	13.72	0.01
NPRS	Baseline - Week 2	11.61 ± 1.61	14.83 ± 1.29	3.05	2.61	0.003
	Week 2 - Week 4	14.67 ± 1.53	17.44 ± 1.54	3.16	3.38	0.001
	Week 4 - Baseline	17.83 ± 1.97	20.83 ± 1.38	6.22	6.00	0.04
NPRS	Baseline - Week 2	10.61 ± 1.14	12.94 ± 1.16	3.11	2.67	0.01
	Week 2 - Week 4	13.72 ± 1.44	15.61 ± 1.24	3.72	3.33	0.01
	Week 4 - Baseline	17.44 ± 2.09	18.94 ± 1.76	6.00	6.83	0.03
NPRS	Baseline - Week 2	11.38 ± 1.29	12.00 ± 1.13	2.22	2.33	0.01
	Week 2 - Week 4	13.61 ± 1.37	14.33 ± 1.02	3.61	3.56	0.01
	Week 4 - Baseline	17.22 ± 1.76	17.89 ± 1.07	5.89	5.83	0.001

Table 3 shows NPRS comparisons across the group (Mixed Model ANOVA). P-value was less than 0.05 showed significance. MODI comparison across the group (Mixed Model ANOVA). Mean (I-J) Difference between baseline MODI and Week 2 MODI across the group comparison was 6.80 and 5.11 between 2nd to 4th week and 11.9 between post-treatment and baseline (table 3).

Table 3: Comparison of Clinical Variables across the Groups

Variables		Mean Difference (I-J)	p-Value
NPRS	Baseline - Week 2	1.61	0.02
	Week 2 - Week 4	1.89	0.01
	Week 4 - Baseline	3.50	0.01
NPRS	Baseline - Week 2	6.80	0.01
	Week 2 - Week 4	5.11	0.002
	Week 4 - Baseline	11.9	0.03
NPRS	Baseline - Week 2	5.08	0.01
	Week 2 - Week 4	6.61	0.01
	Week 4 - Baseline	11.6	0.04
NPRS	Baseline - Week 2	2.89	0.02
	Week 2 - Week 4	3.52	0.01
	Week 4 - Baseline	6.41	0.03
NPRS	Baseline - Week 2	2.27	0.02
	Week 2 - Week 4	3.58	0.001
	Week 4 - Baseline	5.86	0.003

DISCUSSION

The current study investigated the impacts of the Rhythmic Stabilisation and McKenzie methods in combination with a hot pack on the degree of pain, functional status, and mobility among people with non-specific chronic low back pain. This study found that both therapy strategies, Rhythmic Stabilization and the McKenzie technique, were helpful in improving pain, functional status, and mobility, with significant differences in numerical pain rating scale (NPRS), modified Oswestry disability index (MODI), and range of motion (ROM). The McKenzie technique, as opposed to Rhythmic Stabilisation, had, however, shown to be more effective in lowering pain and disability in people with chronic nonspecific low back pain. Arcanjo et al., conducted a systematic review and concluded that pain and impairment are reduced with PNF training for persistent low back pain. This systematic review combed through five datasets. 16 studies met the criteria for inclusion of 722 patients. PNF was compared to a control group, core strengthening, and conventional physical therapy. PNF training decreased pain and impairment when compared to the control group. In terms of pain reduction and disability improvement, PNF training was found to be more beneficial than core strengthening [17]. Rhythmic stabilization was also found to be beneficial in terms of pain reduction, lumbar mobility, and disability. Areeudomwong et al., executed a randomized trial in 2019 to examine the effects of proprioceptive neuromuscular facilitation training and core stabilisation exercises on outcomes. This study concluded that four weeks of CSE and PNF training had advantages in both the short and long term for CLBP patients in regards to pain-related outcomes and deep trunk muscle activation [18]. In the current study, pain-related outcomes also improved after 4 weeks of rhythmic stabilization intervention. A randomized trial conducted to determine whether proprioceptive neuromuscular facilitation training can assist people with chronic low back pain manage their pain and improve their

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balance. According to the findings of this study, a period of three weeks of proprioceptive neuromuscular facilitation training results in greater improvement in pain intensity, disability, and static balance ability in working-age individuals suffering from low back pain than general trunk exercises [19]. These results are consistent with a recent study that reported a significant reduction in pain and an improvement in MODI scores in the rhythmic stabilisation group. A study in 2018 was conducted to check the efficacy of MDT in comparison to placebo in people who had persistent LBP. At the end of the five weeks, the major outcomes were pain severity and functional status. The MDT group was found to be more effective in this investigation. However, according to a recent study, the McKenzie group was equally successful for long-term handicap when compared to the rhythmic stabilization approach. Yamin *et al.*, in a randomized control experiment, McKenzie exercises were compared to general conditioning activities in order to determine which one was more effective for reducing back pain. The study's findings showed that Group B, which received McKenzie exercises, proved significantly higher than Group A, which received general conditioning exercises, with a value of 0.23 ± 0.43 compared to Group A value of 2.6 ± 1.1. In comparison to general conditioning activities, this study found that using the McKenzie approach to treat low back pain results in significant short-term pain relief [20]. In current study's results recommended that McKenzie treatment produces a significant reduction in pain over a period of four weeks; also it produces appreciable results in a reduction of disability and improving lumbar ranges.

CONCLUSIONS

Rhythmic stabilization and McKenzie were helpful in improving pain, functional status, and lumbar range of motion, with significant differences in NPRS, MODI score, and lumbar ranges. McKenzie, on the other hand, has been shown to be more helpful than rhythmic stabilization in lowering pain and increasing lumbar ranges in people with non-specific chronic low back pain.

Authors Contribution

Conceptualization: AN
Methodology: AN, UAK
Formal analysis: SH
Writing-review and editing: MU

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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